

## NOTES ON SOME BRITISH AGARICS

COMPILED BY R. WATLING

### 1. Records of *Coprinus* species (Coprinaceae) R. Watling.

Whilst carrying out a survey of the bolbitiaceous fungi of the British Isles several of the smaller members of the genus *Coprinus* were encountered, many of which proved to be new records for the British Isles. Full descriptions of these fungi, accompanied by nomenclatural notes where ever necessary, are given; field notes and records made by M. J. Richardson have also been utilised where appropriate and my thanks to him are here recorded. Several generalizations have resulted from the studies carried out in the field and laboratory by Orton, Richardson and myself on these coprinoid fungi. It has been found that carpophore size can vary quite considerably in a single taxon and spore size may vary over a much wider range than first thought both when compared with the spore ranges in a comparable group of prati-colous agarics and when single populations or carpophores of a given species are considered. As indicated by Lange (1915) and other authors since, particularly Jossierand (1933), veil characters are constant and diagnostic (see Kühner 1926, Locquin 1947 and Konrad & Maublanc 1948).

(a) *Coprinus bisporus* J. Lange in Dansk Bot. Arkiv 2 (3): 50 (1915).

Fig. 1, a and a'

*Pileus* up to 16 mm high before expanding, campanulate at first, pale alutaceous at the disc but paler almost white towards the margin, darkening very little with age except when the dark spores can be seen through the thin flesh, appearing quite polished at first but soon hoary, sulcate striate, deliquescent. *Stipe* 10-35 mm  $\times$  2-4 (5-6 at base) mm, white, fragile, tapered upwards slightly to distinctly swollen at the base, frequently rooting and then usually fused to other carpophores, above or below the substrate surface. *Gills* almost free, deliquescent, pale buff or even white then purple black, fairly crowded, margin white and sterile. *Flesh* in mature carpophores white; taste and smell pleasant, not distinct.

*Basidia* 2-spored, clavate,  $25-30 \times 7-9 \mu$ , hyaline; *basidiospores* elongate elliptic,  $9.5-14.5 \times 5.5-7.5 \mu$ , dark brown, with prominent, distinctly eccentric germ-pore and fairly obvious apiculus. *Brachycystidia* hyaline, subglobose to pyriform up to  $15 \mu$  wide; *cheilocystidia*  $30-50 \times 20-25 \mu$ , numerous, hyaline, vesiculose; *pleurocystidia* absent. *Pileocystidia* sub-cylindrical with swollen base,  $70-100 \times 10-20 \mu$ , with apex  $5-7.5 \mu$ ; cells of the *pileus epicutis* with distinct pedicel, ca  $20-30 \mu$  wide; *caulocystidia* similar to the *pileocystidia*.

On dung, dung and straw and dung mixed with soil. Bramham Park 7 v 1965 Watling C2612; Askham Bryan 9 v 1965 Watling C2613.

This species is very close to both *C. congregatus* and *C. ephemerus*. At the Spring foray of the Yorkshire Naturalists' Union, 1966 it was possible to compare populations of all three agaric species; when fresh material was available to compare directly they could be distinguished on macroscopic characters alone. *Coprinus congregatus* (see next page) is similarly coloured to

*C. bisporus* but differs on several microscopic characters other than the consistently four-spored basidium. *C. ephemerus* on the other hand differs strikingly in the colour of the fresh pileus; it is reddish brown quite brightly coloured particularly at the disc and frequently flushed slightly sepia towards the margin. *C. ephemerus* (Watling 2601C and 2614C Bramham Park Wood, Yorks. 7 v 1966; Watling 2615C Nun Appleton, York, 9 v 1966 Fig. 1 e, e' and e'') also differs from *C. bisporus* in the four-spored basidia but more important it possesses numerous pleurocystidia ( $70-11 \times 25-40 \mu$ ) which are absent in *C. bisporus*. *C. sassii* (= *C. ephemerus* var *bisporus* Sass) cannot be regarded either as the same as *C. bisporus* or, as Lange (1952) has pointed out, in any way connected with *C. ephemerus*: *C. sassii* (Watling A980/1388C Fig. 1 b) can be distinguished in the field from all the coprinoid agarics above described by the dark vinaceous or wine-brownish coloured pileus, and microscopically by the exceedingly large spores;  $13-20 \times 8-11 \mu$ .

(b) *Coprinus congregatus* (Bulliard per St. Amans) Fries, *Epicrisis Syst. Mycol.*, 328 (1838), Fig. 1 c and c'.

The fungus described below is *C. congregatus* in the sense of M. Lange (1952).

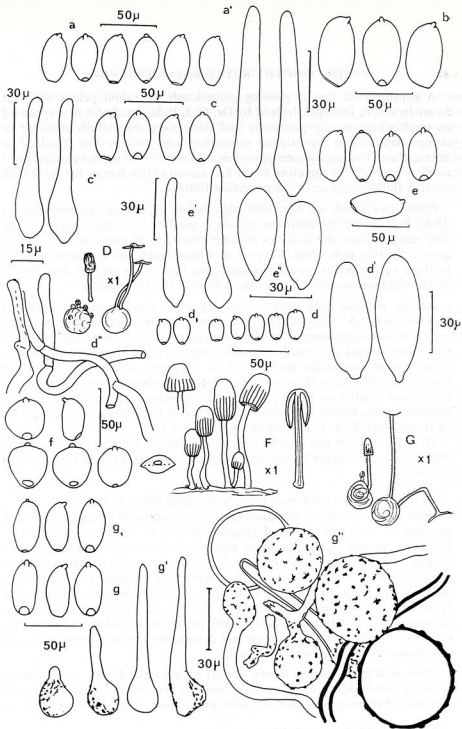
*Pileus* 5-15 mm, campanulate, becoming slightly expanded, yellow ochraceous then more slate grey but for yellow ochraceous disc, appearing polished when young but soon becoming hoary, then finally matt, dry, sulcate striate almost to disc when mature, subdeliquescent. *Stipe* 5-30  $\times$  3-5 mm, white, firm but hollow, tapered upwards, slightly swollen at base and frequently fused to others to form a fasciculate clump. *Gills* almost free, deliquescent, pale buff then purple brown, fairly crowded, margin white, sterile. *Flesh* pale sepia but more whitish in young pileus, white in stipe; smell distinct and pleasant; taste not distinct.

*Basidia* 4-spored, clavate,  $20-24 \times 10.5-12 \mu$ , hyaline; *basidiospores* elongate elliptic,  $12-13 \times 6-7 \mu$ , brown with a distinct olivaceous or sepia flush, germ pore distinct and slightly eccentric, apiculus fairly prominent. *Brachycystidia* numerous, hyaline; *cheilocystidia*  $40.5-50 \times 26-28 \mu$ , numerous, hyaline; *pleurocystidia* similar but far less numerous. *Pileocystidia*  $52-63 \times 6.5-8 \mu$ , hyaline with obtuse apex; cells of *pileus epicutis* with distinct pedicel ca  $12-24 \mu$ , long and  $10-11 \mu$  broad; *caulocystidia* rudimentary or like *pileocystidia*.

On hen dung, vegetable debris and straw, Clough Head, Hebden Bridge, Yorkshire 23 vii 1958 Watling 121C; on composted straw, Loch Skene, Aberdeenshire, 25 viii 1960 Watling 433C; on straw from cattle shed Stockton Lane, Yorks. 6 v 1966: on clay intermixed with pig dung Askham Bog, Yorkshire 7 v 1966; on straw and dung mixture Nun Appleton, Yorks. 9 v 1966. Watling 2611C.

M. J. Richardson has recently found a coprinoid fungus macroscopically and microscopically extremely similar to *C. congregatus* growing on rabbit pellets but it is never caespitose; further observations in the laboratory and the field are required.

(c) *Coprinus filamentifer* Kühner in Bull. Soc. nat. Oyonnax 10-11 Suppl.: 3 (1957) (= *C. filamentifer* Kühner nomen nudum in Kühner & Romagnesi, Flore Analytique des Champignons Supérieurs). Fig. 1 D, d, d' and d''.



FIGS. 1-2 *Coprinus* spp.

Magnification is as indicated; basidiospores are all at the same magnification; other microscopic structures are at a lower magnification.

FIG. 1. a & a' *Coprinus bisporus* Watling 2612C, a basidiospores, a' pileocystidia; b *C. sassii* Watling A 980/1388C basidiospores; c & c' *C. congregatus*, c Watling 121C basidiospores, c' Watling 433C basidiospores; D-d'' *C. filamentifer* Watling 617C, D habit sketch, d basidiospores, d' basidiospores of carpophore produced in culture, d' pleurocystidia, d'' hyphae from veil; e, e' & e'' *C. ephemerus* Watling 2601C, e basidiospores, e' pileocystidia, e'' pleurocystidia; F & f *C. galericuliformis*, F habit sketch, f basidiospores; G-g'' *C. heptemerus*, G habit sketch Watling 551C, g basidiospores Watling 551C, g' basidiospores of carpophores produced in culture Watling 551C, g' pileocystidia Watling 2706C, g'' veil constituents Watling 2706C.

A coprinaceous fungus growing gregariously on rabbit pellets was sent to me from Co. Donegal, Ireland by Dr. C. J. P. la Touche; it first appeared as small white, woolly primordia and these were successfully matured in damp chambers on the original substratum and isolates also fructified in pure culture. The carpophores agreed in all respects with the fungus described as *C. filamentifer*; it therefore is the first record of this fungus for the British Isles. A full description of the collection follows.

*Pileus* very small, up to 7 mm high before expanding, commencing as white, flocculose primordia then rapidly expanding, not striate except at the very margin where the floccules become removed, deliquescent. *Stipe* up to  $40 \times 0.75-1.25$  mm white, covered in whitish grey veil remnants, similar to those of the pileus, swollen towards the base. *Gills* grey at first, finally black with faint purplish cast, as the colour of the spore-print.

*Basidia* 4-spored with well-developed pedicel, clavate, ca  $18 \times 8-10 \mu$ ; *basidiospores*  $7-8 \times 4-5 \mu$ , elongate elliptic lacking perispore sac, dark brown with distinct central but fairly small germ-pore and appearing as if shouldered about the small apiculus. *Brachycystidia* hyaline, thin-walled, numerous; *pleurocystidia*,  $60-70 \times 25-30 \mu$  hyaline, thin-walled, large and similarly distributed as those in the unrelated *C. atramentarius*; *cheilocystidia* similar but smaller up to  $58 \mu$  long. *Veil* consisting of elongate thin-walled filaments  $3-8 \mu$  broad. On rabbit dung, 1,000 ft Co. Donegal West Ireland, 12 ix 1962 legit C. J. P. la Touche, Watling 617 C.

M. J. Richardson has found a very similar fungus which appears to differ only in its rather larger basidiospores ( $9-11 \times 5-6 \mu$ ). Further observations are required.

(d) *Coprinus galericuliformis* Losa ex Watling. Fig. 1 F and f.

Several carpophores of this uniquely shaped coprinoid fungus were found growing on bare soil in a cool greenhouse, soil to which no manure etc. had been recently added. In spore shape and structure of the cuticle this fungus is closely related to *C. plicatilis* but differs markedly in the much more sturdy habit and in the shape of the pileus when mature. The Edinburgh material agrees in all respects with Losa's description and although the spores are slightly smaller than those depicted in Locquin's much fuller account of the same fungus (1947) it is still preferable to assign the Edinburgh collection to this taxon. This material constitutes the first British record; the species name is herewith validated.\*

*Pileus* rich tawny to red brown or rust paling only slightly on maturity, up to 15 mm high, campanulate or cylindrical not or hardly expanding and then only becoming semiglobate, smooth, shining, semideliquescent. *Stipe*

\**Coprinus galericuliformis* sp. nov.

*Pileus* primo glandiformis vel ellipticus altus/  $6-15$  mm vix expansus clare fulvo-ochraceus vel ferrugineo-mellinus vulgo ad discum obscurius coloratus. *Stipes*  $10-35 \times 2-3$  mm, subaequalis ad basim leviter incrassatus, albus. Caro concolorata siccitate intus albida. *Lamellae* fere liberae ex albo albidae vel caccinae dein nigro-umbrinae. *Basidia* 4-sporigera; *basidiosporae*  $10.5-12.5 \times 10-11 \times 5-7 \mu$  lentiforme poro germinativo. *Cheilocystidia* ellipsoideo-vesiculosa. *Pleurocystidia* et velum absentia.

Ad terram Royal Botanic Garden, Edinburgh, 14 v 1966 Watling 2631C (Typus in Herb E).

This is *Coprinus galericuliformis* Losa Espana described without a latin description in Ann. Jard. Bot. Madrid 3: 154 (1943). c. f. *C. velaris* Fr. (1838).

up to 35 mm long  $\times$  2–3 mm, slightly or distinctly swollen towards the base, white, smooth or with but a few white fibrils. *Gills* free, almost pure white but then soon tinted sepia and finally purple brown, margin white, sterile. *Basidia* 4-spored, clavate, hyaline ca  $10\ \mu$  broad; *basidiospores* strongly compressed, subglobose to rounded triangular in one view but elliptic in the other  $10.5\text{--}12.5 \times 10\text{--}11 \times 5\text{--}7\ \mu$  more globose than the strawberry shape in *C. plicatilis*, dark brown, with distinct central germ-pore and apiculus. *Brachycystidia* hyaline numerous; *pleurocystidia* absent; *cheilocystidia* globose to elliptic, hyaline. *Veil* remnants, *pileo*- and *caulocystidia* absent.

On bare soil Royal Botanic Garden, Edinburgh, 14 v 1966, Watling 2631C.

(e) *Coprinus gonophyllus* Quélet in Ann. Sci. nat. Bordeaux 14 (1884) Suppl. 5.

Several collections of *C. gonophyllus* have been examined since Orton published the first British record (1957). It seems to be fairly widespread on burnt ground, sterilized soil and plaster much as *Pyronema domesticum* is found on sites of old woodland bonfires, in seed-pans in greenhouses etc. This species however is a little more variable than suggested by Orton's Oxshott and Rothamstead specimens.

*Pileus* 6–15 mm white, tinged ochraceous at disc and becoming greyish to slate blue due to disappearance of veil material, expanding rapidly, edge striate; disc with large 1–2 mm ochraceous scales, silky fibrillose-floccose towards the margin. *Stipe* 20–36  $\times$  0.75–1.0 (1–2.5 mm at base) mm, white, flocculose-punctate at the base, unequal or slightly swollen towards the base. *Gills* at first pure white, becoming deep umber purple then blackish purple; edge at first white and floccose, lilaceous when young, finally black and rapidly deliquescent.

*Basidia* 4-spored, clavate, hyaline; *basidiospores* irregularly subglobose to distinctly lenticular  $6.5\text{--}9.5 \times 6\text{--}7 \times 4.5\text{--}6.0\ \mu$  with a prominent apiculus and distinct germ-pore, truncate in some views, dark brown, with fairly thick wall. *Brachycystidia* hyaline, numerous; *pleurocystidia* clavate, irregularly obtuse often with a small apical papilla; *cheilocystidia* similar to *pleurocystidia* but smaller, more numerous and not usually papillate, up to  $50\ \mu$  long and  $15\ \mu$  wide. *Veil* consisting of irregularly branched, thin-walled and thick-walled, filamentous hyphae  $1.5\text{--}3\ \mu$  broad which have irregular bosses on the outer surface.

On potting compost in seed pans Royal Botanic Garden, Edinburgh 10–17 ii 1961, appearing regularly after heavy watering, Watling 552C coll. 1 and 2; on sterilized soil in greenhouse, Halifax, Yorkshire 27 ix, 1964 legit A. C. Collinge, Watling 1021C (Fig. 2b).

Further collections: on plaster in old house, Edinburgh legit A. Grierson x 1951 (spores  $7.0\text{--}8.5 \times 5\text{--}7 \times 4\text{--}5\ \mu$ ); on burnt soil Howldale, Pickering, Yorkshire legit W. G. Bramley 31 x 1962 Watling 619C (spores  $7\text{--}8 \times 6\text{--}7.5 \times 4\text{--}5\ \mu$ ); on wet plaster in house, Edinburgh 20 iii 1963, Watling 638C (spores  $7.5\text{--}8.5 \times 6\text{--}7 \times 4.5\text{--}6\ \mu$ ); on burnt (?) soil Freshfield, Lancashire, Orton 1147 (spores  $6.5\text{--}8.0 \times 6\text{--}7 \times 5\text{--}5.5\ \mu$ ).

Two possible variants have been examined, one is a very dark, large-spored form with a very robust habit possibly approaching what Romagnesi has

described as *Coprinus spilosporus* (1951). It differs, however, from this species in the distinctly truncated spores (germ-pore very distinct, up to  $3\ \mu$  broad) lacking evidence of paler hilar areas; (on wool stuffing in old couch, Leeds Infirmary, Yorkshire legit C. J. P. la Touche, 11 ii 1964, Watling 822C; spores  $9\text{--}12 \times 7\cdot5\text{--}9\cdot5 \times 6\text{--}7\cdot5\ \mu$  resembling blackcurrants in shape, Fig. 2c).

In the other collections the spores although of a similar size and shape lack the dark brown pigmentation; they are paler and have a slight sepia tinge (on plaster, Edinburgh, Henderson 1411, 19 vi 1954 spores  $7\text{--}8 \times 5\cdot5\text{--}6 \times 4\cdot5\text{--}5\cdot5\ \mu$ ). Further observations are therefore required; however there is little doubt that this last collection is very close if not conspecific with *C. gonophyllus*. The collection by Orton from Freshfield (Orton 1147) has also a fairly high percentage of similarly pale coloured spores.

(f) *Coprinus heptemerus* M. Lange and A. H. Smith in *Mycologia* 45 751: (1953). Fig. 1 G, g, g' and g''.

Material of *Coprinus heptemerus* which appeared on rabbit pellets collected on two or three occasions at Lindrick Common, Yorkshire, during the summer of 1961, was forwarded to me for identification by Dr. J. Harper. Harper later used this material in his study on various aspects of the ecology of coprophilous fungi (Harper and Webster, 1964). Since that date no further material came to my notice until June 1966 when a single carpophore appeared in the laboratory on dung of red deer originally collected at Glen Isla, Angus, by M. Richardson, and one collection was located in the cryptogamic collections at the Royal Botanic Garden, Edinburgh. Since this material was examined Dr. J. Webster has sent material from Norfolk and Richardson found several collections in the Scarborough area, Yorkshire. All these collections agree with the original description and a later one (1952) given by Morten Lange both in carpophore morphology and cultural characteristics. As British material has not been previously documented a full description follows.

*Pileus* up to 10 mm high in bud, conic to campanulate, soon expanding and then up to 11 mm wide, sulcate almost to the disc which is dark vinaceous brown, more pallid-greyish towards the margin, glistening, mottled. *Stipe* up to 50 mm  $\times 0\cdot5\text{--}1$  (1.5–2 at base) mm, equal or slightly swollen towards the base, whitish then flushed ochraceous from base up, minutely pubescent throughout, glistening. *Gills* close, pallid or grey finally black, margin white, rapidly deliquescent. *Flesh* whitish-hyaline, lacking distinct taste or odour.

*Basidia* 4-spored, dimorphic; *basidiospores*  $11\cdot5\text{--}14\cdot5 \times 5\text{--}7\cdot5\ \mu$  cylindrical elliptic, pale brown, with large and distinctly eccentric germ-pore and pronounced suprahilar depression. *Cheilocystidia* vesiculose, elliptic to subglobose up to  $45\ \mu$  broad; *pleurocystidia* absent; *brachycystidia* globose to subglobose  $15\text{--}20\ \mu$ . *Pileocystidia*  $75\text{--}100\ \mu$  long with acuminate apex  $2\cdot5\text{--}4\ \mu$  broad, swollen towards the base and there up to  $20\ \mu$  broad, hyaline or slightly ochraceous, some slightly to strongly encrusted, frequently almost globose at the base and then with only a small or slightly elongated papilla and fairly strongly encrusted; *pileus epicutis* composed of subglobose cells up to  $30\ \mu$  broad, covered with an irregular layer of encrusted, brown,

globose to subglobose cells interconnected with  $\pm$  thin walled, red brown to yellowish filamentous or vesiculose hyphae. Homothallic.

On cow dung, Midmar Castle grounds, Aberdeenshire 14 vii 1957, Henderson 2009; on rabbit dung, Lindrick Common, Yorkshire viii 1961 legit J. Harper, Watling 551C; on deer dung, Glen Isla, Angus, 25 vi 1966, legit M. J. Richardson, Watling 2706C; culture from a single spore isolate taken from a carpophore collected on rabbit dung, Holkham Sand dunes, Norfolk 30 v 1966 legit J. Webster, Watling 2077. The same fungus from the Lindrick Common locality was sent to G. Laundon, Commonwealth Mycological Institute; it now appears in the culture collections as No. 84.303. Also on roe deer dung, Cloughton, Yorkshire, 16 ix 1966; on cow dung, Wrea Head, Scalby Yorkshire, 16 ix 1966; on rabbit dung, Langdale End, Yorkshire, 17 ix 1966; on sheep dung, Rosedale Head, Yorkshire 19 ix 1966.

(g) *Coprinus heterosetulosus* Locquin in Bull. Soc. mycol. Fr. 63: 76 (1947). Fig. 2 A, a', a'', a'''.

This species is well-characterised by the small spores coupled with the presence of clamp-connections on the carpophore hyphae and the presence of fairly thick-walled, strongly coloured pileocystidia, intermingled with hyaline thin-walled cells. As far as can be ascertained the collection described below constitutes the first record for this country.

*Pileus* up to 7 mm high before expanding, disc dark brown but paler and more rust towards the margin, sulcate striate rapidly expanding and very deliquescent, at first appearing smooth but soon quite hoary and almost glistening. *Stipe* white, up to 20 mm long  $\times$  1-2 mm, fragile, tapered slightly upwards, elongating very rapidly. *Gills* almost free, deliquescent pale ochraceous at first but rapidly brown black, fairly crowded, margin white and sterile.

*Basidia* 25-30  $\times$  8-9  $\mu$ , 4-spored, hyaline, clavate with distinct pedicel; *basidiospores* 8-12  $\times$  4.5-6.5  $\mu$ , elongate elliptic, slightly flattened, ovate in face view, germ-pore slightly eccentric and so obscured in some views, apiculus fairly prominent. *Brachycystidia* subglobose-elliptic ca 15  $\mu$  broad; *pleurocystidia* absent; *cheilocystidia* subglobose-globose, 15-25  $\mu$  diameter, some slightly elongated, faintly yellowish coloured in ammoniacal solutions. *Pileocystidia* of two types subcylindrical hyaline cells with swollen base and subobtuse apex 3-4.5  $\mu$  broad, in a few almost acute, 60-70  $\times$  10.5-13.5, intermixed with distinctly coloured to hyaline units  $\pm$  thick-walled, irregular cells of  $\pm$  similar shape, usually smaller 23-33  $\times$  6.5-8  $\times$  2.5-3  $\mu$ .

On mixture of straw and goat dung in farm yard Carriber Glen, Linlithgow, 4 vi 1966, Watling 2680C.

(h) *Coprinus martinii* Favre ex Orton in Trans. Brit. mycol. Soc. 40: 201 (1960). (= *C. martinii* Favre nomen nudum, in Bull. Soc. mycol. Fr. 53: 286 (1937).

*C. martinii* typically grows at the base of sedge and rush clumps in fairly wet places and although described by Favre in 1937 it was not validly published until 23 years later. This *Coprinus* is infrequently recorded but this is probably due to its habitat and when suitable marshes are searched it is usually found. Kühner (1953) recorded the presence of this or a very closely



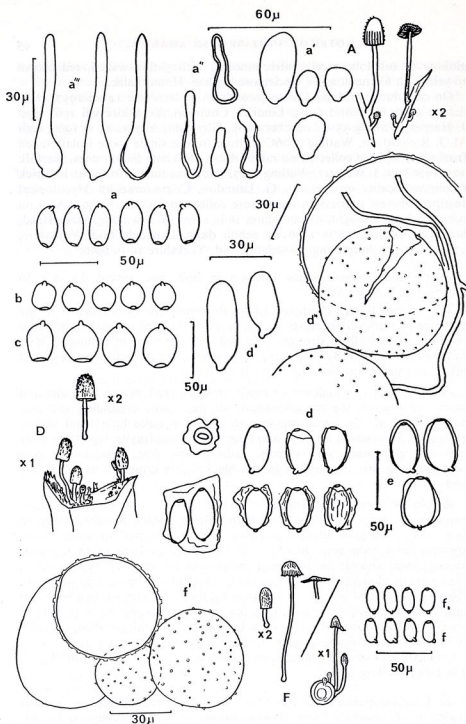


Fig. 2. A-A''' *Coprinus heterosetulosus* Watling 2810C, a habit sketch, a basidiospores a' cheilocystidia, a'' small, coloured pileocystidia, a''' large, hyaline pileocystidia; b basidiospores of *C. gonophyllus* Watling 552C; c basidiospores of coprinoid agaric related to *C. gonophyllus* Watling 822C; D-D'' *C. aff. martinii* Watling 2600C, D habit sketch, d basidiospores showing end-on view of a single spore and a spore-pair in a perispore sac, d' pleurocystidia, d'' veil constituents; e basidiospores of *C. martinii* Watling 759C; F-F' *C. stercoreus*, F-F' Watling 2534C, F habit sketch, f basidiospores, f<sub>1</sub> basidiospores of carpophore produced in culture, f' veil cells Watling 2534C.



related fungus growing on wood but gave no further details. A collection of a coprinoid fungus made by M. J. Richardson whilst on a Yorkshire Naturalists Union foray was passed to me and agreed in most respects microscopically with *C. martinii* (Fig. 2 D, d, d' and d''). It was on wood and had slightly different pileus colouring to the sedge fungus. Further observations are therefore required but a description of this collection is offered to assist in ascertaining whether these lignicolous and caricicolous coprini belong to one and the same taxon. From the spore shape and size alone they appear not to be conspecific.

*Pileus* up to 10 mm before expanding, whitish, mealy, with greyish or brownish flecks at the disc, campanulate at first, rapidly expanding and becoming slightly striate at the margin. *Stipe* white, then becoming tinted greyish and with a few flecks of farinaceous floccules from the veil, caespitose. *Gills* at first pale grey then becoming more black brown.

*Basidia* clavate, 4-spored ca  $9\ \mu$  broad; *basidiospores*  $10\text{--}12 \times 5.5\text{--}6.5 \times 6\text{--}7\ \mu$ , dark brown, superficially appearing irregularly roughened but on careful examination they are observed to be immersed in a strongly wrinkled perispore sac equipped with flanges often over  $1\ \mu$  deep (frequently two spores may be found in a single perispore sac).\* *Pleurocystidia* numerous elongate clavate, hyaline  $25\text{--}40 \times 13\text{--}15\ \mu$ ; *cheilocystidia* similar but shorter. *Veil* consisting of numerous subglobose to elliptic cells up to  $90\ \mu$  in diameter ornamented with hydrochloric acid insoluble warts and intermixed with a few but consistently present very thin, filamentous hyphae,  $1\text{--}2\ \mu$  broad.

On moss on old stump, Buttercrambe Wood, Yorkshire, 7 v 1966, Watling 2600C and 759C with spores  $12.5\text{--}15.5 \times 7.5\text{--}8.5 \times 8.5\text{--}10\ \mu$  on *Juncus* debris from High Force, Middleton on Teesdale, was taken as typical *C. martinii* (Fig. 2c).

(i) *Coprinus miser* (Karst.) Karst. in Symb. Fenn. 10: 61 (1882).

Since my redescription of this species (1960) based on British material several further collections have come to my notice. It is in fact a very widespread fungus; as the epithet suggests it is small and hence very easily missed.

Collections from Yorkshire on cow dung, Grass Wood, 28 iv 1961, Watling 557C; on cow dung Gate Close and Wathe Wood, Pateley Bridge, Watling 194C and 195C; on cow dung Malham 5 ix 1961, Watling 369C; on cow dung, Troutdale, Scarborough 5 v 1962, Watling 458C; on rabbit dung Bramham Park, near Leeds, 7 v 1966 legit M. J. Richardson; on rabbit dung Buttercrambe Moor Wood, York, 6 v 1966 legit M. J. Richardson; Kirkham Abbey, Malton 8 v 1966.

Also on horse dung Edinburgh, Watling 988C; on horse dung Edinburgh legit P. Myerscough 28 ii 1965, Watling 2488C. Recorded by P. D. Orton on horse dung from Black Wood of Rannoch, Perthshire and by M. J. Richardson on dung of various sorts collected in Perthshire, Stirlingshire, Wigtownshire, Mid and West Lothian, and in the North of England by Dr. Pauline Watson, Durham.

Karsten in the original description does not mention the reddish colour but as indicated by some collections and pointed out to me subsequently by Orton this colour may be lacking even in the youngest primordia; even

\*It has been impossible to observe the development of these spore-pairs.

in typically coloured carpophores the red colour is soon lost on their expansion and maturation.

(j) *Coprinus saichiae* Reid in Trans. Brit. mycol. Soc. 44: 430 (1958).

Several hundred carpophores of this species appeared in the late summer of 1962 on newly lawned areas of the demonstration garden at the Royal Botanic Garden, Edinburgh. All carpophores agreed microscopically with the excellent description originally given by Reid but the following information concerning field characters based on Wat. 474C may be added, *Pileus* up to 5 mm high in bud. *Stipe* up to  $30 \times 0.75-1$  mm, white, equal or slightly swollen at attachment with grass remains, smooth or faintly flocculose in some areas due to veil remnants which soon disappear. *Gills* pallid at first soon becoming black, almost free. The spores are slightly paler than in the closely related *C. gonophyllus*.

(k) *Coprinus stercoreus* Fries in Epicrisis Syst. Mycol. 251 (1838). Fig. 2 F, f and f'.

A small *Coprinus* species was sent late in the summer of 1961 for identification by Dr. J. Harper, Sheffield. It had been collected originally on rabbit pellets at Lindrick Common, Yorks. and further material was sent throughout the 1961 season. The material agreed in all respects with *C. stercorarius* as outlined by Kühner and Romagnesi (1953) but differed from the interpretation by Dennis, Orton and Hora (1960) and Lange (1915) which was that of a small coprinoid fungus springing from a sclerotium. A second collection a year later was noticed in Edinburgh growing on horse dung which had been brought into the laboratory and kept in damp chambers. Further collections were made by M. Richardson and myself on sheep pellets collected in 1965 and early 1966 and kept in damp chambers. In the field it has been collected at Buttercrambe Moor Wood, Yorkshire (6 v 1966). It therefore appears that this small and elusive coprinus is widespread and probably quite common.

The taxon outlined by the French authors is quite distinct from the agaric described by Lange (1915). Orton has suggested (personal communication) that in fact *C. stercorarius* in the sense of Lange is not really Fries' fungus for in the original description there is no mention of a rooting base and/or a sclerotium. A name, *Coprinus tuberosus* Quélet (1878) already exists for the *C. stercorarius* described by Lange.

The coprinoid agaric tabulated in Flore Analytique des Champignons Supérieurs (1953) under *C. stercorarius* has been attributed to Bulliard (1795), even Fries himself indicates Bulliard's plate as representing his fungus; nevertheless the name was changed by Fries to *C. stercoreus*. This is therefore the valid name, even though Fries reverted thirty-six years later to using *C. stercorarius* in Hymenomycetes Europaei.

A full description of the British material is given:

*Pileus* 3-12 mm high in bud, 2-8 mm when expanded, dirty white to ash grey with a very faint ochraceous tint at the disc, covered in a loose, white evanescent meal, becoming sulcate plicate at the margin which soon splits, finally sepia except at the disc where it retains the faint ochraceous colouration. *Stipe* 20-35  $\times$  0.15-0.75 mm white but covered for nearly its full length with a loose white micaceous powder which often forms a ring-like zone

where the pileus pulls away from the stipe, finally white with a slight ash grey tint. *Gills* crowded, free, greyish white finally black brown.

*Basidia* 4-spored,  $20-25 \times 5-5.5 \mu$  clavate with elongate base; *basidiospores* (6.5) 7-7.5 (8)  $\times 3-4 \mu$ , cylindric elongate, some slightly phaseoliform in some views, with a distinct germ-pore but lacking a perispore sac. *Brachycystidia* up to  $22 \times 4.6 \mu$ ; *cheilocystidia* swollen, up to  $12 \mu$  broad; *pleurocystidia* similar but slightly less broad. *Veil* consisting of hyaline, globose cells up to  $60 \mu$  in diameter, and although lacking thickened walls, ornamented with short peg-like units (not crystals), accompanied at the edge of the pileus and base of the stipe by a few bladder shaped cells  $50-100 \times 15-20 \mu$ .

On rabbit pellets Lindrick Common, Yorkshire, May-July 1961 legit J. Harper (since grown in the laboratory on sterilized rabbit pellets, Watling 354C Coll. 1 and 2); on horse manure Edinburgh Watling 486C; on sheep pellets Selmuir, Midlothian 14 and 17 xi 1965 legit M. J. Richardson (after 1 month in damp chamber); on sheep pellets Callander, Perthshire 25 i 1966 legit M. J. Richardson (fruiting 4-6 weeks after collection) Watling 2534C on horse dung Strathardle 17 viii 1966; Richardson records this same fungus on sheep dung from Mull of Galloway, Wigtownshire iv 1966; on sheep dung Arran, Buteshire 23 iv 1966; on rabbit dung, Buttercrambe Moor Wood, Yorkshire 6 v 1966; on roe deer dung Carriber Glen, Linlithgow 6 vi 1966; on cow dung Glen Isla, Angus 25 vi 1966; on deer dung Glen Isla, Angus, 2,750 ft 25 vi 1966; on sheep dung, Glen Tarbert, Argyllshire, x 1966 legit Dr. M. Noble; on sheep dung, originally collected on Arran, Scotland by D. J. Jeffray. A coprinoid agaric which developed on rat dung mixed in a barley seed sample sent from Kirkwall, Orkney, during March 1966 to the Seed Testing Station, East Craigs, Scotland, is also considered to belong to this taxon.

This fungus differs from *C. tuberosus* in the size and shape of the basidiospores, their lack of a distinct perispore sac, the veil consisting of globose cells ornamented with prominent peg-like structures as opposed to being merely warty granular or with crystalline ornamentation and in never arising from a sclerotium (Watling 195C from Halifax, Yorkshire; growing on manure and with spores  $9-11 \times 5.5-7 \mu$  is taken as typical of the interpretation in the New Check List of British Agarics and Boleti (1960) for *C. stercorarius* Fr. (= *C. tuberosus*).

(1) *Coprinus subdisseminatus* Morten Lange in Mycologia 45: 777 (1953). Fig. 3 A, a, a' and a''.

*Pileus* up to 8 mm high before expanding, rounded ovate, plano-convex when mature, but not revolute, sulcate striate to the disc often depressed, pale ochraceous, slate grey at margin, not deliquescent. *Stipe* 35-45  $\times$  0.45-1.5 mm white at first, on maturity hyaline, fluffy white at the base otherwise quite smooth, veil absent. *Flesh* pallid, flushed sepia under disc. *Gills* subdistant, adnate to almost free, pallid then dark brown.

*Basidia* 4-spored,  $20-30 \times 9-10 \mu$ , hyaline, clavate; *basidiospores* 9-12  $\times$  5-6.5  $\mu$  germ-pore central or subcentral, more often the latter, opaque, moderately brown with a slight tinge of sepia. *Cheilocystidia* 30-70  $\times$  10-20  $\mu$  numerous, subcylindric with obtuse apex and slightly swollen towards

the base, hyaline; *pleurocystidia* and *caulocystidia* absent or the latter rudimentary; *pileocystidia* hyaline, thin-walled,  $60-100 \times 10-20 \mu$ , subcylindric, only slightly swollen at the base, *pileus epicutis* composed of subglobose cells up to  $50 \mu$  broad.

On leafy debris in newly formed border and spreading onto marginal lawn Royal Botanic Garden, Edinburgh, vii-ix 1964 Watling 900C and 992C. In some respects this fungus resembles *C. hiascens* Lange (1915), but differs in the shape and size of both cheilocystidia and basidiospores. Watling 2710C from grassy plot Royal Botanic Garden, Edinburgh with spores measuring  $6.5-11 \times 4\frac{1}{2}-5\frac{1}{2} \mu$  and possessing a central prominent germ-pore is taken as typical *C. hiascens* (Fig. 3b b, b' and b'').

(m) *Coprinus utrifer* Jossierand (nomen nudum) in Bull. Soc. mycol. Fr. 64: 26 (1948) Fig. 3 C, c and c'.

This fungus, clearly figured and described by Jossierand, although not validly published, has rarely been met with since (see Kühner and Romagnesi 1953). However a large series of carpophores referable to this fungus developed in the laboratory on dung collected due to unfamiliar primorida having been observed on it in the field. This appears to be the first British record. Valid publication is not rectified, however, at this date because material suitable for a type collection is not available. A full description of the British collection follows:

*Pileus* up to 8 mm in bud, expanding to 2-5 mm diameter ovate then revolute with  $\pm$  upturned and inrolled edge, ash grey, scurfy due to filamentous mealy veil, matt, then smoother when expanding and becoming more dirty brownish when loosing veil fragments, the remainder of the pileus scales become radially arranged, deliquescent, striate at outer part. *Stipe* up to 30 mm  $\times$  0.5-0.75 mm, white then hyaline, with a few whitish or greyish filaments and fragments from the veil, becoming smoother, equal or slightly swollen towards the base with faintly tomentose foot or persistently scurfy fibrillose base. *Gills*  $\pm$  free, fairly crowded, whitish to pallid at first then becoming very dark brown almost blackish and with a paler margin.

*Basidia* 4-spored, clavate, with  $\pm$  developed pedicel; *basidiospores*  $8-9 \times 4.5-5.5 \mu$  elliptic to elliptic elongate, slightly amygdaliform in some views, smooth with a fairly small, central germ-pore. *Brachycystidia* numerous, hyaline, thin-walled; *pleurocystidia* and *cheilocystidia* up to  $30 \times 10-15 \mu$ , broadly clavate, thin-walled. *Veil* consisting of thin-walled, smooth, globose to elliptic cells up to  $60 \mu$  long  $\times$   $12-30 \mu$  wide, intermixed with thick and thin-walled hyphal elements many of which are irregularly branched and/or coarsely granulate or with bosses irregularly distributed on their outer surfaces; filamentous units rigid up to  $7.5 \mu$  broad. *Clamp-connections* not seen.

On very old cow dung Tomich, Inverness-shire, 15 vi 1958 legit P. D. Orton. On sheep dung in pasture Malham, Yorkshire, 7 ix 1961. P. D. Orton and R. Watling, Watling 605C (accompanied by *C. vermiculifer* see below). My thanks are due to P. D. Orton for placing his notes at my disposal.

(n) *Coprinus vermiculifer* Jossierand ex Dennis in Kew Bulletin 19: 113 (1964) (= *C. vermiculifer* Jossierand in Bull. Soc. mycol. Fr. 60 5, (1944) nomen nudum) Fig. 3 D, d and d'.

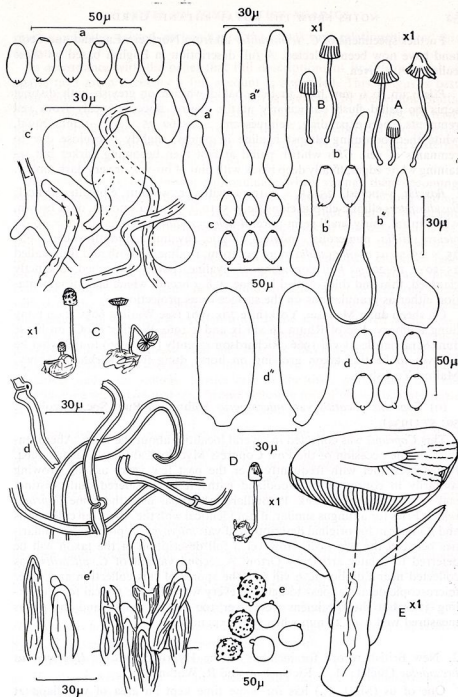


FIG. 3. *Coprinus* spp., *Russula* spp. & *Hygrophorus bresadolae*  
Magnification as in FIG. 1.

A-a'' *Coprinus subdisseminatus* Watling 900C, A habit sketch, a basidiospores, a' cheilocystidia, a'' pileocystidia; B-b'' *C. hiascens* Watling 2710C B habit sketch, b basidiospores, b' cheilocystidia, b'' pileocystidia C-c' *C. utrifer* Watling 605C, C habit sketch, c basidiospores, c' veil constituents; D-d' *C. vermiculifer* Watling 840C, D habit sketch, d basidiospores, d' hyphae constituting the veil; E-e' *Russula grata* Watling 941C, E habit sketch, e basidiospores, e' group of macrocystidia & indurated basidium; single macrocystidium.

Further specimens of *C. vermiculifer* all from Northern England and Scotland have now been collected. A full description in English based on these collections is given.

*Pileus* up to 6 mm high in bud, pallid whitish or greyish with distinct sepia or pallid flush particularly at the centre, floccose mealy from veil remnants, soon expanding, deliquescent. *Stipe* 60–75 × 0.75–1 mm equal, white then becoming almost hyaline in places, slightly flocculose due to remnants of veil. *Gills* whitish pallid at first then becoming darker but retaining white edges, finally deep black with hint of brown, or very dark umber.

*Basidia* 4-spored, 25–35 × 8–10  $\mu$  with or without elongate pedicel; *basidiospores* elliptic-elliptic elongate, 9.5–10 × 5.5–6  $\mu$  smooth, dark brown, with central, fairly small germ-pore. *Brachycystidia* numerous 10–12 × 10–15  $\mu$ ; *pleurocystidia* numerous, inflated elliptic, hyaline, smooth-walled, 60–75 × 25–30  $\mu$ ; *cheilocystidia* more pyriform, hyaline, smooth and thin-walled 25–50 × 15–20  $\mu$ . *Veil* consisting of hyaline, poorly branched, distinctly clamped, thin and thick-walled hyphae, 4–8  $\mu$  broad, which lack ornamentation either as granulations on the surface or as projections.

On sheep dung Malham, Yorkshire 7 ix 1961 (see Watling 605C); on pony dung Kilmory, Isle of Rhum 26 viii ix and x 1964 Watling 840C; on horse dung Strathardle 21 viii 1966. Richardson recently (8 v 1966) found what he believes to be this taxon growing on horse dung from Kirkham Abbey, Malton Yorkshire.

(o) *Coprinus plicatilis* var. *microsporus* Kühner in Bull. Soc. mycol. Fr. 50: 57 (1934).

This *Coprinus* was collected in several localities about the Burn, Aberdeenshire on the occasion of the Post Congress Mycological foray, August 1964. It has been met with frequently over the past few years usually growing solitarily in copses or by woodland paths; it is considered quite distinct and worthy of specific rank. Patouillard (1889) has used the name *Coprinus velaris* Fries for a fungus similar, if not identical with the Aberdeen collections and Kühner in his original description of var. *microsporus* pointed to similarities between the two taxa. However a full description of the taxon will be deferred to a later article by Orton. A second variant of *C. plicatilis* was collected near Edinburgh, 6 viii 66. The spores of this collection and other microscopic details appear to agree in every way with the typical form (Watling 32C) but the specimens were over 100 mm in height and the pileus measured well over 25 mm when fully expanded.

2. New British record for member of the Hygrophoraceae: *Hygrophorus bresadolae* Quélet. M. J. Richardson and R. Watling.

One of us (M. J. R.) has for some time kept an area of woodland at Selmmuir, Midlothian under very careful and continual observation. On one occasion an agaric, which at first sight appeared to be a yellow variant of *Hygrophorus hypothejus*, was collected amongst pine litter in an area predominantly of *Pinus sylvestris* but with a few scattered *Larix*. A preliminary scanning of the European literature made two points obvious; that no such agaric had previously been recorded for the British Isles and that



much confusion existed pertaining to the status and relationships of this fungus.

In accordance with the belief that full descriptions of British material of agaric taxa are a necessity a full account is appended. This fungus is best dealt with in "North American species of *Hygrophorus*" by Hesler and Smith (1963), where it is obviously described as a variety of *H. speciosus*. We have not seen fresh material of the variety of this North American species even though the type locality was visited by one of us (R. W.); herbarium material appears to agree in all essential details.

*Pileus* up to 45 mm broad, campanulate when young, then becoming expanded-umbonate or loosing umbo, bright orange when young fading to yellowish orange or yellow chrome at the margin, but retaining the bright colour at the centre or flushing faintly olivaceous at the disc, glutinous, pellicle separable, margin at first incurved and connected to the stipe by a lemon yellow veil. *Gills* decurrent to adnate-decurrent, pale citron or pale creamy lemon, often with a flush of chrome or orange at the base and those near the margin of the pileus, never white, distant, rather broad, sometimes veined on the sides, edge fertile. *Stipe* up to 80 mm long  $\times$  4.7 mm, pale buff, bistre, equal or faintly swollen towards the centre, tapered at the base, and the lower portion ornamented with the remains of the viscid veil which leaves an evanescent annular zone and floccose silky buff fibrils at the base; apex minutely yellow flocculose-pruinose, pithy. *Flesh* orange-reddish immediately under the cuticle, particularly at the disc, which may become slightly sepia when over mature, chrome yellow in rest of pileus and outermost parts of the stipe, but more lemon in the centre.

*Basidia* 4-spored, elongate-clavate to cylindrical clavate,  $45-55 \times 7-8 \mu$ ; *basidiospores*  $7.5-9.5 (10) \times 4-5 \mu$  ellipsoid or very slightly tear-drop shaped, pale yellow in Melzer's solution. *Cheilo-* and *pleurocystidia* appear to be absent. *Pileus trama* with cells  $8-16 \mu$  diameter and *cutis* of repent to more or less erect, gelatinised hyphae  $1-6 \mu$  broad. *Clamp-connections* present on the cuticular and hymenophoral trama hyphae.

Amongst pine litter, Selmuir, Midlothian, Scotland 23 x 1965, M. J. Richardson Watling 2533C (fig. 4 B and b). Also badly eaten specimen from heather bank under young pines, near reservoir, Dall Wood, Rannoch, Perthshire, Scotland, 10 x 1964, P. D. Orton (Fig. 4 A). We are most grateful to P. D. Orton for allowing us to examine his collection and notes.

The synonymy and misidentifications can be summarised as follows:—

*Hygrophorus bresadolae* Quél. apud Bresadola, Fungi Tridentini 1: 11 (1881)

Syn.: *H. coloratus* Peck, 1908 fide Hesler and Smith, 1963

*H. speciosus* var. *kauffmanii* Hesler and Smith, 1963

as *H. aureus* Arrh. apud Fr. in Fries, Icones Selectae Hymenomycetum, Plate 166. 2: (1851)

as *H. speciosus* Peck in Bresadola, Iconographia Mycologica, Plate 313 (1908) non Peck 1878

as *H. aureus* Fr. in Lange, Flora Agaricina Danica, 5: Plate 162 e (1938)

as *H. hypothejus* var. *aureus* (Fr.) Imler in Bull. Soc. mycol. Fr. Plate 12 (1934)

as *Limacium aureus* in Pilat, Mushrooms and other Fungi, Plate 17 a (1961).



This species differs from *H. hypothejus* and *H. speciosus* in stature, shape and colour of the pileus and stipe. One author (R. W.) is familiar with scores of fresh collections of both the last species.

3. Two new British records of Russulaceae from Aberdeenshire. P. D. Orton and R. Watling.

(a) *Russula grata* Britzelmayer in Hym. Sudbayr 10: 17 (1893). Fig. 3, E, e and e'.

*Pileus* 90–120 mm, firm, convex rapidly becoming flattened then plano-convex often deeply so, toast brown with rich tawny hues about the centre or with markings of rust ochre, distinctly fibrillose striate towards the margin

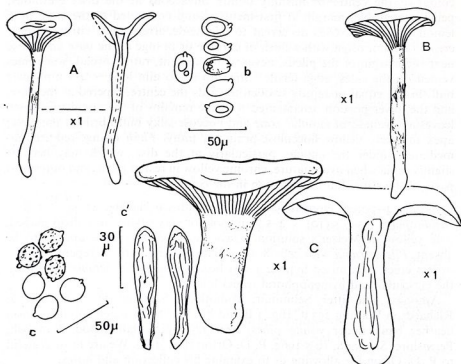


FIG. 4 *Coprinus* spp., *Russula* spp. & *Hygrophorus bresadolae*  
Magnification as in FIG 1.

A Habit sketch of *Hygrophorus bresadolae* Orton collection; B & b *H. bresadolae* Watling 2533C, B habit sketch, b basidiospores; C–c' *Russula lundelli* Watling 2679C, C habit sketch, c basidiospores, c' macrocystidia.

and for halfway tuberculate-striate to pectinate. *Stipe* 40–70 × 20–30 mm, thick, robust, white at apex otherwise pale cream, becoming dotted rust or tawny, especially towards the base, not powdered, slightly streaky umber in places especially where bruised. *Gills* close, white flushed faintly ivory and then becoming darker although finally only pale cream, bruising after a long time to rust or yellowish ochre brown. *Flesh* unchanging under pileus, white slightly rust ochraceous in stipe, firm; with  $\text{Fe SO}_4$  on stipe pinkish then tawny; *taste* mild, *odour* strong, oily, only slightly foetid.

*Spore-mass* B\*; *basidiospores*  $8-10 \times 8-9 \mu$ , including ornamentation, subglobose with prominent although fairly low warts and with few if any connecting lines. *Macrocystidia* clavate, variable with irregularly shaped apex and filled with amorphous material which yellows in Melzer's solution.

On lawn, edge of ornamental coppice, under *Fagus* and *Quercus*, Crathes Castle, Aberdeenshire, 16 viii 1964, Watling 941C.

A typical member of the *Foetentinae* but differing from the other members in the mild taste coupled with the spore ornamentation which does not consist of wings and thick amyloid ridges.

(b) *Russula lundelli* Singer in Lilloa 22: 719 (1951)† Fig. 4 E, e and e'.

*Pileus* up to 86 mm, convex then expanded, depressed in centre, orange red to orange ochre, darker reddish in places or tawny with coppery tints in some areas, smooth then becoming tuberculate at edge, only peeling for about 1/3 diameter of pileus. *Stipe* 70–80  $\times$  25 mm, equal or slightly attenuated upwards, faintly stippled, as if pruinose when immature, then striate-rugulose. *Gills* free, whitish then deep cream, subcrowded, or slightly more crowded near margin, all of one length, with margin even. *Flesh* white, firm, hard, with Fe SO<sub>4</sub> olive brown in cap, slightly pinkish on stipe; *taste* acrid; *odour* pleasant.

*Spore-mass* G–H\*;  $6-8 \times 5.5-7 \mu$ , subglobose with low warts and few connections. *Macrocystidia* clavate up to 10  $\mu$  wide and filled with amorphous material which stains yellow or orange in Melzer's solution, slightly encrusted towards the base.

Under *Betula*, in mixed birch/conifer woodland, Braemar, 18 viii 1964, P. D. Orton and R. Watling. Orton 2675 and Watling 2679C.

Typified by the robust habit, the acrid taste, bright coloured pileus, deeply coloured spore-print and small spores. This is the fungus described by Lundell and Schaeffer as *Russula pulcherrima* (1938); *R. pulcherrima* is preoccupied (see Velenovsky 1920).

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\*Nomenclature for spore-print colour follows Pearson, The Genus *Russula*. Naturalist, 1948.

†cf. Singer in Bull. Soc. mycol. Fr. 54 161 (1938) description of *Russula mesospora*.

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